



2014-09-08

DRDC-RDDC-2014-L181

Produced for: Dr. Kendall Wheaton
Team Lead – Warfare Centre Sciences Team
Canadian Forces Warfare Centre
Shirley's Bay, 3701 Carling Ave, Bldg. T104-A
Ottawa, ON
K1A 0K2

Scientific Letter

Canadian Naval Fire Support for land operations – conceptual overview

Background

This report offers an overview of the Royal Canadian Navy's intent to re-introduce Naval Fire Support (NFS) to its fleet and how this capability will support land operations. Its purpose was to provide exercise planners associated with the Canadian Forces Warfare Centre and Australia's Defence Science and Technology Organisation meeting in December 2013 with sufficient details to determine whether to include NFS capabilities during upcoming exercise events (CAGE IIb and JOINTEX). Following the planning conference, this concept was adopted for these exercises.

Statement of results

Overview: Royal Canadian Navy (RCN) fire support for land operations has a long history, including during the Second World War (for instance, the Dieppe Raid and D-Day operations) and the Korean Conflict. Other naval nations have engaged in NFS more recently, including the Royal Navy as part of the Falkland Islands conflict and the United States Navy during the 1991 Gulf War.

The RCN has undergone some significant changes over the past twenty-six years. Canada's 1987 Defence Policy required improvements in naval capabilities to ensure "...greater flexibility, a more appropriate balance of air, surface, and underwater assets and the reorientation of Canadian naval forces toward effective operations in the Atlantic, the Pacific and the Arctic oceans."¹ The 1994 Defence White Paper called for a fleet with "...multi-purpose combat capabilities to carry out a wide variety of domestic and international operations."² In the 1990s, the Iroquois class mid-life conversion through the Tribal Update and Modernization Project (TRUMP) introduced both an Area Air Defence and a Task Group Command and Control capability, and the Canadian Patrol Frigate (CPF) introduced a multi-purpose combatant. Neither of these platforms was equipped with an NFS capability. In the case of TRUMP, the

¹ *Challenge and Commitment: A Defence Policy for Canada* (Ottawa: Supply and Services Canada, 1987), p. 51.

² *1994 Defence White Paper* (Ottawa: Government of Canada, 1994), p. 34.



Iroquois Class destroyer's 5 inch gun was replaced with a 76mm (3 inch) anti-air gun. With the elimination of large calibre guns, a formal decision was announced on 17 March 1993 to cease the NFS role for the RCN due to the ineffectiveness of either the 76mm or 57mm to support troops ashore, combined with the additional risk to ships from shore-based counter-fire.³

In 2008, the *Canada First Defence Strategy* (CFDS)⁴ committed to renewing the core equipment platforms of the Canadian Armed Forces, including ships to replace Canada's destroyers and frigates. An NFS capability in future fleets, particularly in the Canadian Surface Combatant, would enhance the necessary flexibility and range of maritime options available to the Government of Canada in employing a multi-role, combat-capable military.⁵

Securing Canada's Ocean Frontiers (SCOF) is an updated strategic document that follows-on from *Leadmark*. SCOF provides guidance which will enable the RCN to develop the new capabilities that are required of a Medium Force Global Projection Force. Specifically, it states that the Navy will have:

"...new weapons systems to provide support and protection to land forces ashore; and new capabilities to support the insertion and support of Special Operations Forces ashore."⁶

Clearly, the support and protection of land forces ashore, as well as maritime units in direct support of a mission, is an essential element of future fleet capability. This is further supported by the Navy's *Horizon 2050 Strategic Concept* which states:

"Weapons and sensors considered for introduction into tomorrow's fleet will permit our maritime forces to play an increasingly direct role in contributing to operations ashore, from sea-based reconnaissance and surveillance assets on the one hand to precise covering lethal and non-lethal fires and missile defence on the other."⁷

Within the context of an ever-changing international environment, the CFDS outlines six core missions for the CAF. Of particular interest to NFS is mission 5:

"*Lead and/or conduct a major international operation for an extended period.*"⁸

The Government has indicated that the CAF is to be capable of leading international peace and security missions. It indicates that "these operations will often be conducted under the auspices of the United Nations and the North Atlantic Treaty Organization. Canada will continue to support and contribute to these key international bodies."⁹

Therefore, Canada needs to maintain a credible level of interoperability with its allies in developing the tools and the capabilities for conducting NFS.¹⁰

³ *Concept for Naval Fire Support*, D. Sing, Commodore, Director General Maritime Force Development, May 2012, pp. 7-8.

⁴ Department of National Defence, *Canada First Defence Strategy* (Ottawa: Government of Canada, 2008), p. 4.

⁵ *Concept for Naval Fire Support*, op. cit., p. 8.

⁶ B-GN-007-000/AG-001, *Securing Canada's Ocean Frontiers – Charting the Course from Leadmark* (Ottawa: Directorate of Maritime Strategy, 2005), p. 26.

⁷ *Horizon 2050 – A Strategic Maritime Concept of the Canadian Armed Forces* (Ottawa: Chief of Maritime Staff, 2012), p. 49. Note that this concept was developed, but not approved, by the RCN.

⁸ CFDS, op. cit., p. 10.

⁹ *Ibid.*, p. 9.

¹⁰ *Concept for Naval Fire Support*, op. cit., pp. 12-13.



As described in the *US Joint Operational Access Concept* (JOAC), NFS “...require lethal and nonlethal applied flexibility and responsiveness between domains... Achieving this objective increases the need to adopt flexible procedures for requesting, approving, and coordinating fire support among the Services... Target acquisition must be rapid and accurate, and procedures must be developed to minimize the latency or delay between identification and engagement of potentially fleeting critical targets.”¹¹ NFS needs to consider all aspects of C4ISR necessary to facilitate fire support to operations ashore.

Adversarial nations with modern weapon systems can currently project military power from shore-based systems up to 180 km out to sea. In order to prepare the Area of Operations (AO) prior to the entrance/insertion of naval, land, air, or SOF forces into the littoral, or protect forces once onshore, maritime forces require an NFS capability that could disable this threat.¹²

Operational requirements

To be effective at NFS operations, certain criteria must be met, including:

- a. Range – ability to reach hostile targets from a safe stand-off distance without putting own forces at risk from enemy fire or counter fire;
- b. Accuracy – ability to strike the designated target with as much accuracy as possible in order to reduce or eliminate collateral damage. This is especially important given the complexity of engaging in fire support operations from sea to shore; and
- c. Lethality – ability to effectively neutralize, or destroy the designated target as rapidly and as efficiently as possible.¹³

The following desired effects of NFS missions need to be considered in the development of an NFS system:

- a. Destruction – NFS designed to render a target ineffective by removing its capability to perform its primary mission;
- b. Neutralization – NFS designed to render a target temporarily ineffective or unusable and to hamper its movement;
- c. Suppression – NFS designed to degrade the performance of a target during the timeframe that suppression is occurring;
- d. Harassment – NFS designed to disturb enemy troops’ rest, curtail movement, lower adversary morale; and
- e. Non-Lethal Effects – NFS designed to promote the achievement of the mission through selective destruction of critical infrastructure or through a demonstration of force designed to deter aggression and facilitate operations (ie., Non-combatant Evacuation Operations).¹⁴

Overview of existing capabilities

¹¹ *US Department of Defense, Joint Operational Access Concept (JOAC), v. 1.0, dated 17 January 2012, p. 29.*

¹² *Concept for Naval Fire Support, op. cit., p. 13.*

¹³ *Ibid., pp. 13-14.*

¹⁴ *Ibid., p. 14.*



Today, the RCN has a limited ability to defend itself in the littoral and to project power from the sea. This ability will further diminish until new ships, technologies, and systems are introduced to the Fleet. The intention is to have NFS capability resident in surface and sub-surface combatants. The risks involved in entering the littoral in a conflict region have increased over time and will continue to do so with state and non-state actors able to acquire weapons that can threaten naval units. Consequently, the CAF needs to consider what capabilities Canada must acquire to ensure that the Navy can operate in the littoral with other trusted defence partners:

- a. Guns – Canada's current naval gun systems were not designed for naval fire support and they are oriented toward individual ship self-defence. In recent studies conducted by DRDC, these guns, due both to their limited range, calibre and dispersion error, have proven inadequate for NFS operations, suggesting that a larger calibre gun is required. Ideally, the future Canadian Surface Combatant (CSC)¹⁵ will have a proven gun system that can adequately satisfy anti-air self-defence, anti-surface engagement (including over-the-horizon engagements), and NFS engagements on fixed or mobile targets; and
- b. Missiles – The Halifax Class Modernized Frigate now possesses the HARPOON Block 2 surface-to-surface missile that is capable of engaging land targets in excess of 120 km. The evolution of threats may require the procurement of a longer range missile that will allow naval forces to secure and prepare a littoral environment, as well as engage in precision strike on inland targets.¹⁶

NFS capability development constraints

The manner in which NFS capabilities are developed must include due consideration for C4ISR doctrine, systems and procedures that will be critical to successful re-introduction of NFS into the 21st century fleet. This includes but is not limited to:

- a. UAVs – Recent operations in the littorals have underscored the need to introduce shipborne unmanned aerial vehicles (UAVs) into the fleet where they can be used as part of the maritime forces' intelligence, surveillance and reconnaissance (ISR) assets. As technologies mature, the nearer term window could also see the gradual introduction of autonomous vehicles in all three maritime dimensions. Not only will such vehicles be well suited to a range of tasks that greatly extend both the sight and reach of the task group, they will also comprise an essential component of a joint force's constellation of intelligence, reconnaissance, surveillance and strike assets, performing tasks in very high risk environments, remotely targeting weapons, delivering precision weapons and conducting post-attack battle assessment; and
- b. Multi-intelligence All-source Joint ISR Interoperability Coalition (MAJIC) – This nine nation coalition includes Canada and has as an aim to continue to advance coalition Joint ISR interoperability through effective integration of technology, people and organization by leveraging technology and process innovation. The expected improvements in C2 processes and decision making, planning, targeting, and battlespace coordination will have an impact on the ability to successfully introduce NFS to the fleet.¹⁷

¹⁵ CSC is the next generation surface ship for the RCN.

¹⁶ *Concept for Naval Fire Support, op. cit., pp. 14-15.*

¹⁷ *Ibid., pp. 15-16.*



Operational considerations for NFS

When considering future NFS capabilities, and in particular those NFS capabilities necessary to prevail in the littoral, it is necessary to examine the RCN's ability to Command, Sense, Act, Sustain and Shield as follows:

- a. Command – When operating in the littoral, whether independently, as a national Task Group, or as part of a combined force, Command appreciation is critical. The RCN's Maritime Component Commander (MCC) construct is fully integrated into the CAF C2 operating concept. Internationally, MAJIIC will stimulate the improvement of C2 processes to effectively employ NFS;
- b. Sense. – A joint and combined approach needs to be promoted, one that integrates available space, air, sea and land based surveillance of land, airborne and air capable threats. NFS Sense capabilities should be able to mitigate challenges such as climate and weather, terrain, and language, using highly integrated networks to share information in a timely manner, and capable of employing ad hoc or mission specific networks. The CAF will continue to shape its collective Sense requirements. MAJIIC will improve allied joint interoperability through ISR sharing to ensure the most appropriate all-source information to support NFS engagements;
- c. Act. – The *Integrated Capstone Concept* (ICC) states that “the future Act concept must encompass the notion of integration since the CAF will be unable to solve complex issues in isolation.”¹⁸ In terms of NFS capability development, this means that issues such as commonality, interoperability, adaptability, responsiveness, and endurance should be considered. This is most critical in a joint and combined littoral region where the ability to coordinate NFS with appropriate authorities, such as the Air Space Coordination Centre (ASCC), the Fire Support Coordination Centre (FSCC), and the Surveillance and Target Acquisition Coordination Centre (STACC), will be essential to mission success;
- d. Sustain. – Comprehensive sustainment encompasses materiel, personnel, and information in taking advantage of organizations, capabilities, systems, and processes from around the globe and deliberately building partnerships. In developing the sustainment capabilities of NFS, consideration should be given to creating strategic partnerships with proven NFS navies, along with special consideration for the size/composition of ship-borne magazines; and
- e. Shield. – The ICC states that “the complex security environment has brought an increase in threats from which Canada needs shielding” and that “a layered Shield response; rapid, adaptable, and able to re-scope, re-scale, and re-configure for any condition set and for any new or changing threat”¹⁹ is necessary. NFS development should take these factors into consideration, bearing in mind what tangible assets (capabilities, people, platforms, and infrastructure) and intangible assets (national interests, culture, values, will, economic well-being, and public opinion) may benefit from NFS capabilities. Therefore, a balanced solution is required, one that enables joint and combined

¹⁸ *Integrated Capstone Concept*, (Ottawa: Chief of Force Development, 2010), p. 41.

¹⁹ *Ibid.*, p. 43.



action ashore while continuing to provide a measure of security for forces at sea.²⁰

PRICIE elements²¹

PRICIE is a construct used by DND/CAF to decompose capabilities into areas of functional responsibilities. A review of PRICIE implications for a new NFS capability includes:

- a. *Personnel, Individual Training and Leadership* – The manning concept for NFS-capable combatants will have to consider reintroduction of NFS doctrine into Navy thinking and operations. NFS expertise for employment in the ASCC, FSCC, or STACC will also have to be considered;
- b. *Research and Development* – DRDC, CFWC and CFMWC are currently exploring the possibilities and future trends in Joint Fire Support (JFS). An ongoing collaboration with defence partners is needed to ensure the RCN does not fall behind its closest allies in the development, design and deployment of NFS;
- c. *Infrastructure and Organization* – Current shore infrastructure is sized to accommodate the Iroquois, Halifax, and Victoria class. The CSC Project will undertake an infrastructure gap analysis and engage with Director Maritime Infrastructure in order to leverage to the greatest extent possible scheduled DND construction initiatives, with the CSC Project funding only those changes required by CSC. This will include acquiring support capability, both for training and equipment that will allow delivery of NFS. Of note, consideration will have to be given to develop nationally-controlled ranges or to avail ourselves of allied ranges in order to permit adequate training;
- d. *Concepts, Doctrine and Collective Training* – As an evolutionary concept, and one that is being reintroduced, new or renewed doctrine and training, tactics and procedures (TTPs) for NFS will have to be defined, trialed and perfected. At present, the main collective training effort is JOINTEX, which should continue to influence and inform an integrated NFS capability that is fully integrated within a JFS capability;
- e. *Information Management* – The critical importance of effective targeting will require a diverse community of players throughout defence and government. The complexity of the future security environment and the requirement to share the Common Operational Picture (COP) with a variety of external stakeholders will require real-time, continuous, high-speed and secure information management systems for commanders to possess a comprehensive and accurate operational picture. This exact picture, and the awareness of it, must be available ashore for the benefit of defence and government decision-makers who may be directly engaged in the targeting process; and
- f. *Equipment, Supplies and Services* (Readiness, Sustainment, Mission Fit) – NFS will be a permanent capability that will be fitted in surface and sub-surface combatants. Degrees of NFS employability will depend upon the platform being

²⁰ *Concept for Naval Fire Support, op. cit., pp. 16-17.*

²¹ *PRICIE: Personnel, Individual Training and Leadership; Research & Development, Infrastructure and organization, Concepts, Doctrine and Collective Training, Information Management, and Equipment, Supplies and Services.*



used. High Readiness units will be able to seamlessly integrate into joint or combined operations that require projecting power ashore.²²

Discussion of results

Possible CAGE IIIb/JOINTEX Exercise Elements related to NFS include, but are not limited to, the following define the:

- a. Processes for obtaining the authority for a NFS mission and the processes associated with issuing and carrying out an order for NFS mission;
- b. What process is used to decide between a missile or guns during a NFS mission?
- c. How would a NFS mission coordinate effects with Canadian air and land elements?
- d. Can the new Unclassified Remote-Sensing Situational Awareness (URSA) systems support NFS? What C2 systems would be involved and will information be able to seamlessly passed between NFS and URSA?
- e. Can the Canadian Army's All-Source Intelligence Centre (ASIC) support NFS? What C2 systems would be involved and can information be seamlessly passed between NFS and ASIC? Can ASIC help avoid friendly fire or collateral damage incidents from NFS?
- f. How would a RCN NFS mission coordinate effects with Allied naval, air and land elements?
- g. How would airspace be deconflicted during a RCN NFS mission?
- h. How would blue force casualties and collateral damage be avoided during a NFS mission in support of land operations?
- i. How will battle damage be assessed during a NFS mission in support of land operations? and
- j. Does the RCN have the ability to communicate and coordinate with all friendly force elements during a NFS mission in support of land operations?

²² *Concept for Naval Fire Support, op. cit., pp. 17-18.*



Conclusion

As the RCN seeks to re-establish a NFS capability, there will be a series of questions about how it will best integrate with other CAF capabilities in support of land operations. The questions posed here are intended to support scenario development for the CAGE IIIb and JOINTEX experiments in order to resolve some of these questions.

Prepared by: Sandy Babcock, Ph.D., DRDC – Centre for Operational Research and Analysis/DJC4ISR/CFD.

This Scientific Letter is a publication of Defence Research and Development Canada. The reported results, their interpretation, and any opinions expressed therein, remain those of the authors and do not necessarily represent, or otherwise reflect, any official opinion or position of the Canadian Armed Forces (CAF), Department of National Defence (DND), or the Government of Canada.

© Her Majesty the Queen in Right of Canada, as represented by the Minister of National Defence, 2014

© Sa Majesté la Reine (en droit du Canada), telle que représentée par le ministre de la Défense nationale, 2014